

Please add the following new claim:

11. A method according to claim 5, and wherein said step of lowering a level in the lauter vessel occurs at the end of lautering a first wort.

REMARKS

The claims have now been reviewed and amended to conform to U.S. practice, but have not been narrowed. The specification has been given headings, counterpart English terms have been included to clarify the translation from the original German language text, and a substitute Abstract has been provided on a separate sheet. No new matter has been added.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "Version with markings to show changes made".

It is respectfully submitted the application as amended above is now in condition for substantive examination on the merits. If any claim or other fees are due by this Amendment, please charge our deposit account No. 13-2855.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

Please change the Title to read: "CONTROLLER AND METHOD FOR CONTROLLING THE FLOW OF BREWER'S WORT FROM A CLARIFYING VAT".

IN THE SPECIFICATION:

At page 1, after the Title, please add a new centered heading as follows:

Field of the Invention

At page 1, please delete first full paragraph and substitute with the following:

The present invention relates to a controller and to a method of "the type referred to in the generic clauses of claims 1 and 2." --controlling the flow of brewer's wort from a clarifying vat by adjusting the height of a raking machine and according to the turbidity of the outflowing wort.--

Page 1, after the first full paragraph, please add a new centered heading as follows:

Background of the Invention

Page 1, please delete the second full paragraph and substitute with the following:

Such a method for controlling the flow of wort when brewing beer is known e.g. from German Offenlegungsschrift DE 43 24 157 A1. In this method, the actual wort flow is measured and compared with a predetermined desired wort flow. In dependence upon the difference between the actual wort flow and the desired wort flow, the opening of a turning vane and the height of a raking machine are controlled. A wider opening of the control valve will normally lead to an increase in the actual wort flow. A grain bed which has settled on the settling bottom of the lauter tun --or clarifying vat-- is broken up by lowering the raking device; this leads to an increase in the actual wort flow as well. In order to achieve the shortest possible lautering --or clarifying-- time, the desired wort flow is increased in steps with a constant gradient during a trending phase. If, during the trending phase, the desired

wort flow increase can be achieved neither by opening the turning vane still further nor by lowering the raking machine because the turning vane is e.g. completely open and because further lowering of the raking machine is not desired, the desired wort flow will be decreased. When the actual wort flow remained constant for a predetermined time or has even increased, the desired wort flow will again be increased in steps with the original gradient.

Page 2, please delete the second full paragraph and substitute with the following:

Although it is impossible to achieve a reduction of the lautering time by the method described in Offenlegungsschrift DE 43 42 157 A1, the lautering --or clarifying-- process still remains, also in the case of this method, the wort-production process which requires the longest time and which should therefore be shortened with regard to a further reduction of the brewing period resulting in a higher number of brewing steps per unit time. This should be done without impairing the wort quality. Furthermore, it is desirable that it should, as far as possible, not be necessary to adapt a controller and a method for controlling the flow of wort from a lauter tun --or clarifying vat-- to various types of beer, feedstock compositions, compositions of rough-ground material, mash consistencies and lauter tun charges. On the contrary, the controller and the method should adapt automatically to a great variety of types of beer, feedstock compositions, etc., by taking into account important parameters.

Page 2, after second full paragraph, please insert a new centered heading as follows:

Summary of the Invention

At page 2, please delete the fourth and fifth full paragraphs.

At top of page 4, please insert a new centered heading as follows:

Brief Description of the Drawings

Page 4, after description of Figure 9, please insert a new centered heading as follows:

Detailed Description of the Invention

Page 4, please delete last paragraph of page with carryover to page 5, and substitute with the following:

Fig. 1 shows a device in which the controller according to the present invention and the method according to the present invention are preferably used. The device comprises a lauter tun --or clarifying vat-- 1, which can be arranged on a support, not shown, so as to provide below the bottom 2 of the lauter tun 1 a space for installing a driving device 3 as well as a lifting and lowering unit 4 for the raking machine 5 arranged within the lauter tun 1. The drive motors for the lifting and lowering unit as well as for the rotary movement of the raking machine are designed by reference symbol M. The raking machine 5 is provided with a drive shaft 6 which is supported such that it is rotatable as well as axially displaceable. The upper end portion 7 of the drive shaft 6 has secured thereto a plurality of horizontal arms 8 which are equally spaced from one another in the circumferential direction and which each support several raking knives 9 for a grain bed settling as a residue on the settling bottom 10 of the lauter tun 1 during the lautering --or clarifying-- process. The lower end portion 11 of the drive shaft 6 of the raking device is in engagement with the driving device 3 and the lifting and lowering unit 4.

Page 6, please delete the first full paragraph and substitute with the following:

After the control valve 16, the lauter wort 25 flows through a lauter --or clarifying-- vessel 19, a throttle valve 21, a lauter pump 26 and a turbidity sensor 27. The throttle valve 21 is preferably implemented as a butterfly valve. The controller 17 controls the lauter pump 26 and, via a controlling element 22, the throttle valve 21 so as to control the discharge of lauter wort from the lauter vessel 19. If this discharge can be controlled in a sufficiently precise manner by the lauter pump alone, e.g. by repeatedly switching the lauter pump on and off or by controlling the lauter pump speed, the throttle valve 21 and the controlling element

22 can be dispensed with in accordance with another preferred embodiment. For the purpose of pressure compensation, the lauter vessel 19 is additionally connected to the lauter tun 1 via a balance pipe 24. By controlling the flow of wort from the lauter vessel 19, the level of the wort 20 in the lauter vessel 19 can be controlled independently of the amount flowing in. The difference between the water level in the lauter tun 1 and the lauter wort level in the lauter vessel 19 generates a pressure difference which forces the water in the lauter tun through the grain bed that has settled on the bottom of the lauter tun. It follows that this differential pressure and, consequently, the actual wort flow from the lauter tun 1 can be controlled by varying the level of the lauter wort 20 in the lauter vessel 19.

Page 6, please delete the second full paragraph and substitute with the following:

Line 22 connects the lauter tun 1 to a mash tun --or mash fermenting vat--.

Page 6, please delete the third full paragraph and substitute with the following:

The device shown in Fig. 1 can be used for executing the method according to the present invention. Fig. 2 to 9 show lautering processes of eight different brews, the first wort being subjected to lautering --or clarifying-- first, whereupon a second wort follows. The total wort quantity amounts to 350 hl in each case. Normally, the following equations are used for calculating from the process data the amounts of total wort, first wort, second wort and sparge water.

At top of page 16, please add a new centered heading as follows:

“English” Legends for the Drawing Figures

IN THE CLAIMS:

Please delete Claims at top of page and insert I Claim.

Please amend the claims to read as follows:

1 (Amended). A [controller] device for controlling the flow of wort from a lauter tun,

comprising [characterized in that the controller is] a fuzzy controller.

2 (Amended). A method of controlling the flow of wort (15) from a lauter tun (1), [which comprises] comprising the [following] steps of:

controlling a control vale ([18]16) and a height of a raking machine (5) in dependence upon a difference between a desired wort flow and an actual wort flow,

opening further the control valve (16) [being opened further] and lowering further the raking machine (5) [being lowered further] if the desired wort flow is less than the actual wort flow and vice-versa;

reducing the desired wort flow if a further increase in the actual wort flow is not to be caused by further opening of the control valve (16) or lowering of the raking machine (5); and [characterized in that]

additionally adjusting the desired wort flow and the height of the raking machine (5) [are additionally adjusted] in dependence upon the turbidity of the outflowing wort so that an increase in turbidity will result in a less substantial lowering of the raking machine and a lower desired wort flow.

3 (Amended). A method according to claim 2, [characterized in that] and taking into account both the change with time of the position of the control valve (16) [is additionally taken into account] as an input variable, and that fast opening of the control valve (16) leads to a decrease in the desired wort flow and to a lowering of the raking machine.

4 (Amended). A method according to claim 2 [or 3, characterized in that], and increasing the inflow of sparge water [will be increased] above the actual wort flow, if the actual wort flow remains below the desired wort flow during a second wort, and [that] reducing the inflow of sparge water [will be reduced] as soon as the actual wort flow approaches the desired wort flow.

5 (Amended). A method according to [one of the] claim[s] 2 [to 4, characterized in that, in addition,], and lowering a level in a lauter vessel (19) [will be lowered], if the actual wort flow remains below the desired wort flow[, especially if the end of the lautering of a first wort is at hand].

6 (Amended). A method according to [one of the] claim[s] 2 [to 5, characterized in that], and reducing the sparge water quantity [will be reduced] in the case of easy-running brews.

7 (Amended). A method according to [one of the] claim[s] 2 [to 6, characterized in that], and taking into account, for triggering a deep cut, the position of the control valve (16), the actual wort flow (15), the height of the raking machine (5) and the turbidity [are taken into account].

8 (Amended). A method according to [one of the] claim[s] 2 [to 7, characterized in that], wherein, if the raking machine (5) has not been moved below a certain level during the first wort, moving the raking machine (5) [will be moved] at least once to a low position during a second wort.

9 (Amended). A method according to [one of the] claim[s] 2 [to 8], [characterized in that] and reducing the lautered amount of first wort [will be reduced], if a brew runs poorly during lautering of the first wort.

10 (Amended). A method according to [one of the] claim[s] 2 [to 9, characterized in that], wherein the poorer the second wort runs, the later [will] the trub [be] is added during a second wort.

Please add the following new claim:

11. A method according to claim 5, and wherein said step of lowering a level in the lauter vessel occurs at the end of lautering a first wort.

Abstract

A controller for controlling the flow of wort from a lauter tun[, said controller being] in the form of a fuzzy controller. A method of controlling the flow of wort from a lauter tun, [said method] comprising the [following] steps[:] of controlling a control valve and a height of a raking machine in dependence upon a difference between a desired wort flow and an actual wort flow, the control valve being opened further and the raking machine being lowered further if the desired wort flow is less than the actual wort flow and vice-versa; reducing the desired wort flow if a further increase in the actual wort flow is not to be caused by further opening of the control valve or lowering of the raking machine; and adjusting the desired wort flow and the height of the raking machine in dependence upon the turbidity of the outflowing wort so that an increase in turbidity will result in a less substantial lowering of the raking machine and a lower desired wort flow.